Bulletin 479 July, 1944

THE IMPORTED LONG-HORNED WEEVIL,

Calomycterus setarius Roelofs

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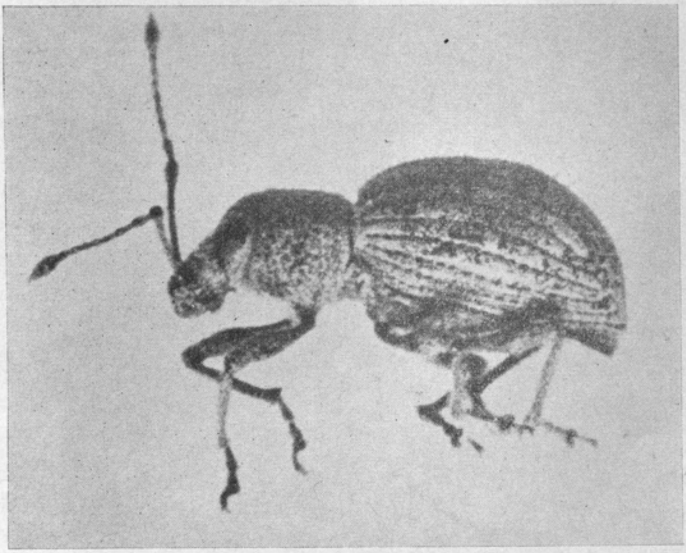

Connecticut
Agricultural Experiment Station
New Haven

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The imported long-horned weevil has been present in Connecticut (5) since 1932, when specimens were received from Lakeville for identification. Since then it has been reported from or found in 17 widely separated towns in the State. It is now known to occur in the towns of Brookfield, Canaan[1], Danbury (10), Fairfield (26), Farmington (27), Greenwich (25), Groton (11), New Canaan (27), New Haven (11), New Milford (10), Norwich, Salisbury (5), Sharon (25), Stratford (25), Washington (10), West Hartford (27) and Westport (6).

This insect is a general feeder, eating the foliage and blooms of certain grasses, legumes, flowering garden plants, vegetables, field crops, ornamental shrubs, house plants, bedding plants, weeds, vines and tree sprouts. It is also a house pest, wandering into dwellings and other occupied buildings, and crawling over the walls, ceilings or furniture. As a result, the economic potentiality of this weevil is twofold, as a plant pest and as a general nuisance.

Historical Information and Distribution

The imported long-horned weevil is indigenous to Japan and was described by Roelofs (18), from that country in 1873, as *Calomycterus setarius*. Kono (13) lists *C. setarius* as occurring in Japan on the Island of Honshu, at Tokio, Sanjodake and Gifu, and on the Island of Kiushu, at Kumamoto. He also listed its Japanese name, Chibimenagazô, which would indicate that the insect was not uncommon.

C. setarius was not known to occur in the United States until 1929 when it was reported from Yonkers, N. Y. (16). In that year thousands of the weevils were present in a localized area, indicating that the weevil had become established there a few years before. Since its discovery at Yonkers in 1929, it has been reported not only from Connecticut and other locations in New York, but also from numerous places in six other states, listed on the following page:

From the evidence at hand, it is very possible that this insect may be present in many other places not yet known or reported.

Very little information has been published in foreign papers about *C. setarius*, and that mainly of a systematic nature. Weigel (23) published a memorandum in 1935, reviewing the existing literature and bringing together the information given in notes and reports concerning infestations in the United States.

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[1] Reported by letter, with specimens, July 31, 1940.

STATE	PLACE	YEAR
Illinois	Arlington Heights[1]	1940
Iowa	Cedar Rapids[1]	1943
Maryland	Baltimore (8)	1937
	Towson (7)	1935
Massachusetts	Holyoke (3)	1938
	Great Barrington[1]	1942
New York[2]	Poughkeepsie[1]	1941
	Amenia	1942
	Millerton (22)	1939
	Montauk Point, L. I. (20)	1941
	Wingdale (24)	1939
Pennsylvania	Downington[1]	1935
	Mechanicsburg (9)	1935
	Philadelphia[1]	1935
Rhode Island	Middletown[3]	1943
	Newport[1]	1943

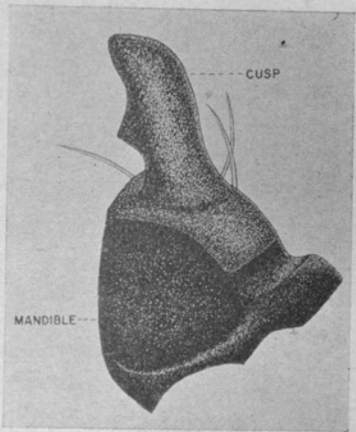


FIGURE 1. Right mandible with cusp attached, inner aspect. Greatly enlarged.

Systematic Position

Roelofs placed the genus *Calomycterus* in the group Cyphicérides by virtue of the width of the beak. This character would not place it in the tribe Cyphicerini Pierce (17), as the beak is narrower than the head at the base. According to the key for the family Curculionidae in Bradley's (4) Manual of Coleoptera, the genus *Calomycterus* belongs to the tribe Eremnini of the subfamily Otiorhynchinae. The Otiorhynchinae (2) are characterized by a scar on each mandible which marks the place where a deciduous cusp is attached. These cusps are lost shortly after the adult becomes active. A cusp of *C. setarius* is shown in Figure 1[4].

[1] Hyslop, J. A., Nov. 26, 1943, by letter. Insect Pest Survey and Information, U. S. D. A., Bur. Ent. Pl. Quar.

[2] Places not listed before.

[3] Jennings, C. C., Dec. 10, 1943, by letter. R. I. Dept. of Agr. and Conservation.

[4] Figures 3, 4 and 8 were prepared by Elizabeth Kaston, Figure 13 a, b and c by Dietrich Bodenstein; all others are by the author. The author also wishes to acknowledge the assistance of Benjamin W. McFarland in preparing the photographs.

Kono described *C. variabilis* (13), native to Japan, in 1930, but renamed it *Platymycterus variabilis* (14) in 1938. In 1934, Marshall (15) described *C. strigiceps*, a weevil found in China, and placed it in the subfamily Ereminae. As a result, there are only two species described in the genus *Calomycterus*. *C. setarius* is the only representative known to occur in the United States.

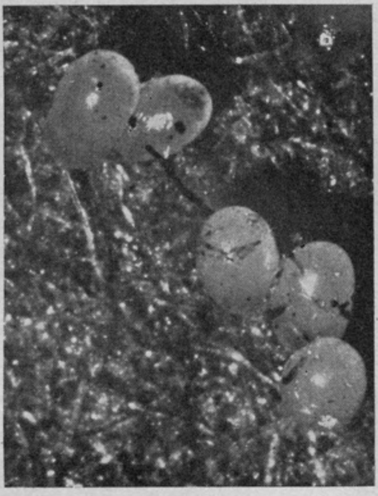


FIGURE 2. Eggs of *C. setarius*.
Actual size about 0.6 mm. in length.

Description

Egg

The egg is smooth, glossy white in color and very delicate. It is elliptical in form, with the sides nearly parallel and the ends bluntly rounded, Figure 2. The average length of 18 newly deposited eggs was 0.59 mm. and the breadth 0.38 mm.

Larva

When first hatched, the larva is white in color, becoming a soiled or greyish white after ingesting food. The larva may have a faint pink cast midway dorsally on the body. This may be restricted to a small area on some individuals and may embrace most of the body on others, especially the younger larvae. Newly hatched larvae are less than a millimeter in length, while the fully grown larvae, Figure 3, are about 5 mm. long.

The average width of the head capsules of 10 newly hatched larvae was 0.22 mm., and that of 98 large and nearly full-grown larvae was 0.79 mm. The head, Figure 4, is light yellow in color without hyaline areas, and the mandibles are reddish brown. There are 16 setae present on the head: 10 epicranial setae, two sutural (near the base of the frontal sutures) setae and four frontal setae. A row of short setae is borne dorsally along the apical edge of the clypeus with four longer setae posteriorly. There are two setae located dorsally and posteriorly on each mandible. The maxilla, Figure 5, bears three long setae laterally and 10 short setae along the apical edge of the lacinia. Each maxillary palpus bears four to eight conical setae on the apex of the last segment.

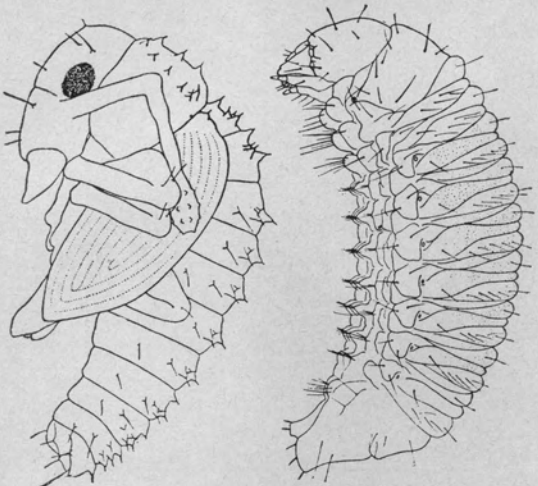


FIGURE 3. Pupa (left) and larva (right). About 15 times natural size.

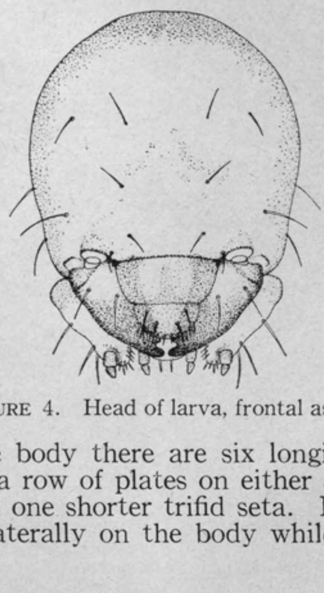


FIGURE 4. Head of larva, frontal aspect.

Ventrally on the body there are six longitudinal rows of trifid setae, Figure 6, and a row of plates on either side, each bearing one long slender seta and one shorter trifid seta. Long slender setae are borne dorsally and laterally on the body while spinulae are present on most of the body.

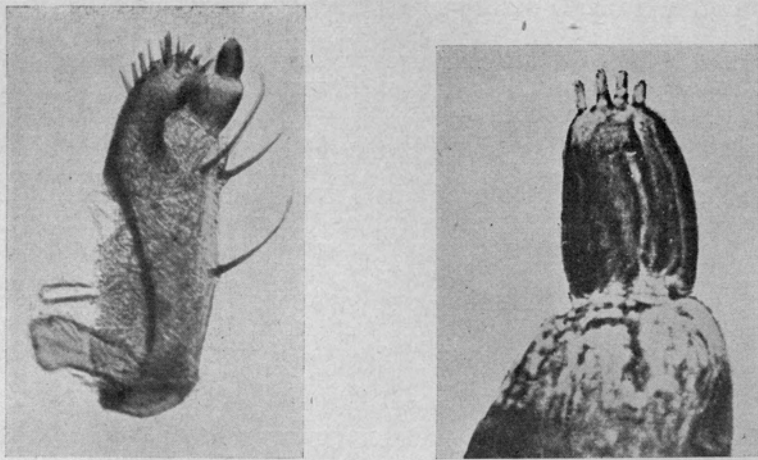


FIGURE 5. left, Right maxilla of larva, dorsal aspect. right, Palpus with conical setae, dorsal aspect. Greatly enlarged.

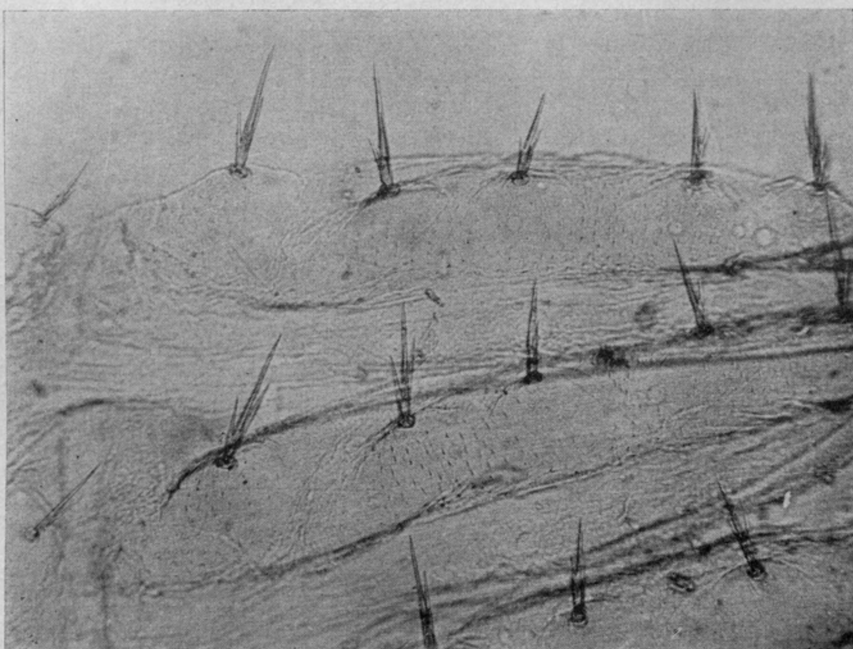


FIGURE 6. Trifid setae and spinulae of larva, ventral aspect. Greatly enlarged.

In Connecticut, the larvae of *Brachyrhinus ovatus* Linn. often are found in the presence of *C. setarius*. *B. ovatus* is usually about the same or larger in size and whiter in color. However, the caudal end of *C. setarius* is bifurcate laterally, Figure 3, a character by which it is easily separated from *B. ovatus* (12). The anal plates, Figure 7, of fully grown *C. setarius* larvae may be heavily sclerotized and brownish or yellow brown in color. The dorsal anal plate is serrated dorsally and bears six short stiff bifid setae while the ventral anal plate is narrower and bears four similar setae. Four long setae are borne on the last abdominal segment dorsally and anteriorly to the dorsal anal plate. There are four intra-anal setae within and anterior to the anal plates, consisting of one long and one very short, borne laterally toward each side.

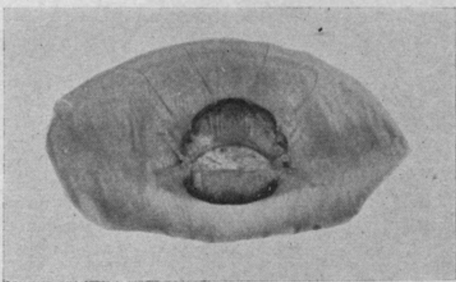


FIGURE 7. Caudal view of larva, last abdominal segment distended. Greatly enlarged.

Pupa

The pupa, Figure 3, is white in color, very fragile and crushes easily. The average length of 11 field-collected specimens was 4.27 mm. When newly pupated the eyes are white, becoming darker with age and black before the pupa transforms into the adult weevil. Reddish brown setae are present on the head, Figure 8, and along the back and sides of the body. All the setae arise from tubercles with those supporting the short, stiff, slightly curved setae usually the most prominent. There are 12 setae on the head: two short setae near the center of the vertex, one long seta above each eye, two short setae on the front between the eyes, two slender setae near and between the bases of the antennae, and two slender setae on each side near the apex of the epistomal suture. There are 18 short setae on the prothorax, with five along each side, four anterodorsal, two median and two posterior. Dorsally between the wings are two short setae anteriorly and four posteriorly. The dorsal abdominal setae are short and form four longitudinal rows from the thorax to the last abdominal segment. The last segment terminates in two long, straight, stiff setae. Dorsad, along the sides, are two rows of slender setae.

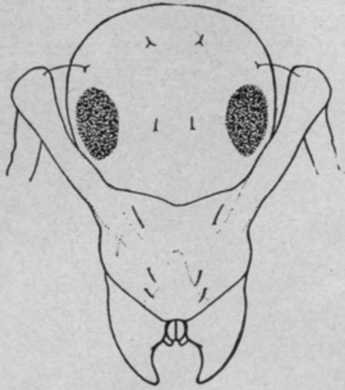


FIGURE 8. Head of pupa, frontal aspect.

Adult

The adult, frontispiece, is black in color but clothed with greyish white scales having a greenish yellow or coppery metallic cast. These scales cause the insect to appear grey. Brown scales are often present on the elytra, pronotum and head, causing some specimens to appear darker in color. The antennae are reddish brown or brown with scape slightly curved and extending just beyond the apex of the prothorax. The funicle is as long as the scape. In *C. strigiceps*, described by Marshall, the scape reaches the middle of the prothorax and the funicle is 1.25 times the length of the scape. The legs of *C. setarius* are reddish brown or brown. Each femur is armed ventrally at the widest part with a small sharp tooth (see Figure 9). The elytra have 10 striae with each interval containing a row of stiff erect setae. Each emanates individually from a puncture. Shorter erect setae also proceed from the head, pronotum and ventral portions of the body. The antennae and legs are clothed with finer reclining setae.

The average length of 41 field collected adults was 4.12 mm., the minimum being 3.59 mm. and the maximum, 4.66 mm.

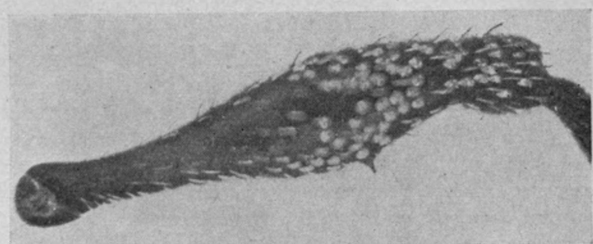


FIGURE 9. Femoral tooth on right mesothoracic leg, lateral aspect. Greatly enlarged.

Mutchler (16) gives an excellent description of the adult which is more complete than the original one given by Roelofs. Roelofs overlooked the femoral teeth which were described from a "cotype" (16) by Buchanan in 1930, and from "typical specimens" by Marshall in 1934.

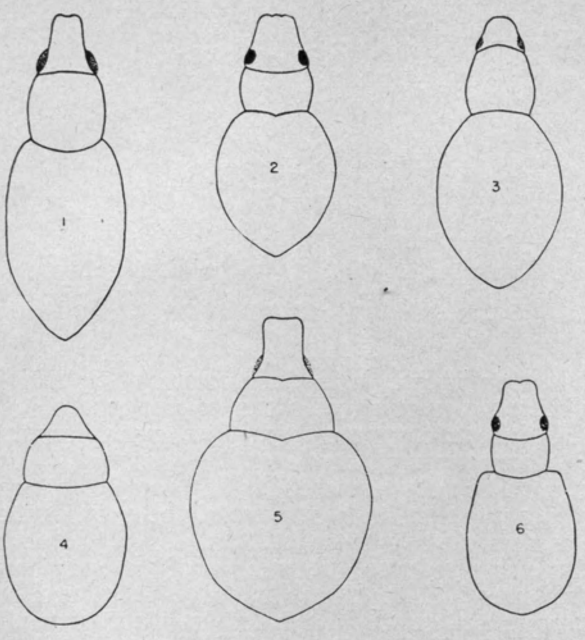


FIGURE 10. Outline drawings of: 1. *Aphrastus taeniatus* Gyll., 3. *Brachyrhinus ovatus* Linn., 4, *Phyxelis rigidus* Say, 5. *Pseudocneorrhinus setosus* Roelofs, and 6. *Myllocerus* sp. which may be mistaken for 2. *Calomycterus setarius* Roelofs. Enlarged about seven times.

An outline drawing of *C. setarius* is given in Figure 10 with those of five other relatively small weevils which might be mistaken for it. The figures given are in proportion to one another for size but enlarged about seven times. The actual sizes of the weevils illustrated were *Aphrastus taeniatus* Gyllenhal, 6.20 mm.; *Pseudocneorrhinus setosus* Roelofs, 5.82 mm.; *Brachyrhinus ovatus* Linn., 5.14 mm.; C. *setarius* Roelofs, 4.56 mm.; *Myllocerus* sp., 4.56 mm., and *Phyxelis rigidus* Say, 4.17 mm. *A. taeniatus* is larger, more elongate, elytra striped and without coarse setae, and browner or lighter in color. *P. setosus*, a Japanese species found in Connecticut, is larger. The depth and breadth are greater in proportion to length, and the weevil is more robust and brown or dark in color. *B. ovatus* is larger, generally a smooth shiny black in color, with the length of the thorax greater than the breadth, and in general more elongate. *Myllocerus* sp., another Japanese weevil found in Connecticut, is approximately the same size, more red brown in color, bearing setae similar to *C. setarius*, elytra with definite humeral angles, and with each leg armed with a femoral tooth. *Phyxelis rigidus* is smaller, darker in color, with the head and eyes less prominent and the abdomen more rounded.

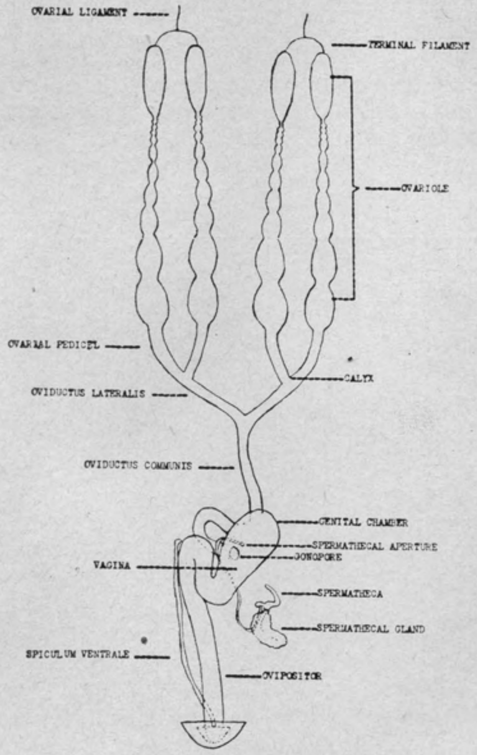


FIGURE 11. Reproductive organs, diagramatic.

Reproductive Organs (19)

C. setarius, although parthenogenetic in habit, has most of the usual organs forming the female reproductive system, with the accessory glands absent. The organs, in general, are similar to those of the pecan weevil, *Curculio caryae* Horn, described by Bissell (1), and the white fringed beetle, *Naupactus leucoloma* Boh., described by Tissot (21). The main differences found in the three species are the spermatheca which are characteristically different in shape, and the terminals of the ovipositors. The terminal of *C. setarius* is devoid of styli, that of *Curculio caryae* devoid of setae, while two oval chitinous plates are present in *N. leucoloma*.

All of the organs of *C. setarius* are embedded in fatty tissue. There are two ovaries, Figure 11, each composed of two ovarioles. Each ovary arises from the oviduct which is located ventrally to the digestive system. The ovaries loop dorsally on each side of the alimentary tract and then anteriorly. The two ovarioles of each ovary are connected distally, their terminal filaments uniting to form the suspensory ligaments, which proceed anteriorly toward the dorsal diaphragm. The ovarian ducts or pedicels of the paired ovarioles unite at the calyx to form the lateral oviducts. These in turn unite, forming the common or median oviduct which terminates at the gonopore located midway in the genital chamber.

The genital chamber lies ventrally to the right of the posterior organs of the alimentary canal. As the vagina narrows posteriorly, it makes a loop to the left and sharply forward, reversing immediately into the ovipositor.

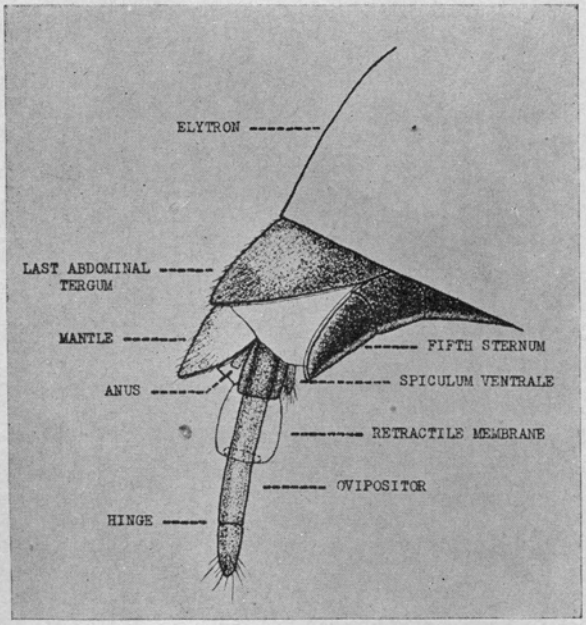
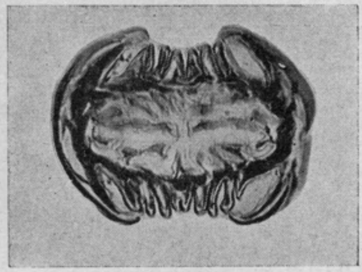
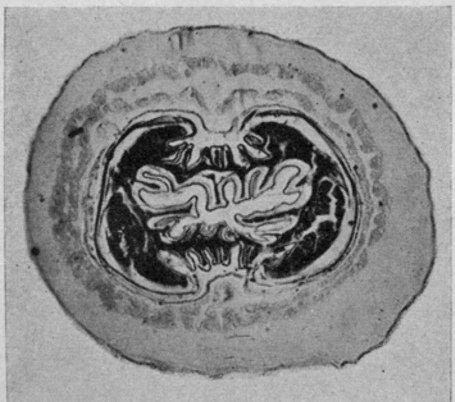


FIGURE 12. Ovipositor and last abdominal segments of adult, lateral aspect. Greatly enlarged.

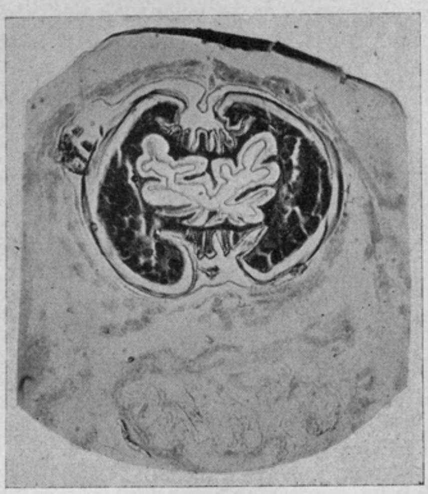
The ovipositor, Figure 12, which, when retracted, is wholly within the body, is about 1.5 mm. in length and slightly curved ventrally. It is enveloped in a membranous sheath, Figure 13-2. Upon projection, the distal portion of the ovipositor extends beyond this membrane. The main tube is strigate, membranous dorsally and ventrally, and heavily sclerotized laterally for rigidity. When the tube is contracted the membranous parts lie in folds, Figure 13-1, protected by the sclerotized sides which form a longitudinal groove both dorsally and ventrally. The tube terminates in two smooth clasper-like structures, Figure 14, hinged laterally, and bearing setae apically and laterally. Expansion occurs laterally along the dorsal



1. Between hinge and apex.



2. Medial area encased in membrane.



3. Near base of ovipositor.

FIGURE 13. Ovipositor, cross sections illustrating structural detail. Greatly enlarged.

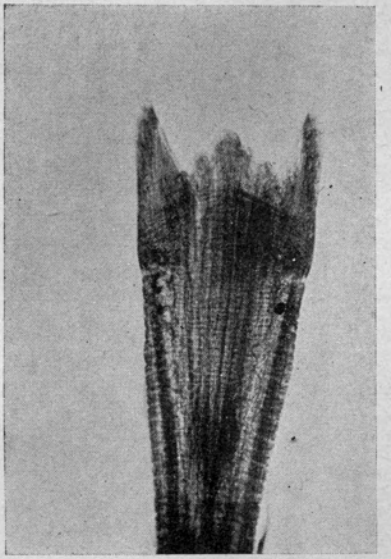


FIGURE 14. Ovipositor expanded laterally, illustrating hinged terminals, heavily sclerotized strigate sides and the folding membrane. Dorsal aspect. Greatly enlarged.

and ventral grooves, exposing the unfolding membranous sections of the tube wall.

The spiculum ventrale is a brownish red, irregularly curved rod, ventral and parallel to, and as long as or slightly longer than the ovipositor in its retracted position. It is attached to the body wall, ovipositor and genital chamber by large muscles, stiffening and giving support for extruding and retracting the ovipositor. The posterior end of the spiculum ventrale terminates in a spade-like sclerite, setiferous externally and apically. This structure may be seen externally when the ovipositor is extruded.

The spermatheca is a small sickle-shaped sclerotized organ lying to the right of the vagina. It is reddish brown in color and the blade-like portion lies anteriorly. The spermathecal duct loops ventrally under the vagina and dorsally over the oviduct, entering the genital chamber wall anterior to the oviduct with its aperture adjacent to the gonopore. The spermathecal gland is membranous and sponge-like with one duct which enters the spermatheca anterior to the spermathecal duct.

Life History

Egg Stage

The eggs have not been collected under normal conditions in the field, although numerous examinations of plants and soil have been made with the aid of a hand lens in areas of infestation. However, eggs have been recovered from the soil in field and laboratory cages. The soil from the field cages was washed through 20-, 40- and 60-mesh sieves and the material withheld on each sieve was examined under binoculars. Eggs were found in the material withheld by the 40- and 60-mesh sieves. Only a small amount of soil was used in the laboratory cages and this was examined without washing or screening.

The eggs in the field cages, recovered by washing and screening, were found in the first inch of soil. The soil used in the laboratory was loose in texture and the eggs were found in the first one-half inch. Individual eggs as well as small clusters were found. Two or three eggs were usually found in a cluster and five was the maximum. Freshly hardened adults removed from the soil in the field have deposited eggs within seven days in the laboratory. Newly emerged adults captured by sweeping on July 2, 1943, deposited eggs in four days.

At room temperature, the average hatching time for 178 eggs, laid on four consecutive days beginning July 21, was nine days. Approximately 40 per cent of the eggs hatched on the ninth day. The minimum hatching period was eight days and the maximum, 12 days. The specific data are given in Table 1.

Table 1. Egg Hatching Record at Room Temperature

		Number hatching				
No. of eggs	Date deposited	8 days	9 days	10 days	11 days	12 days
56	7–21–42	5	20	19	9	3
18	7–22–42	3	11	3	1	0
80	7–23–42	57	21	2	0	0
24	7–24–42	0	19	3	2	0
178		65	71	27	12	3

Larva

The larvae are present in the soil from midsummer until June of the following year. The young larvae begin to feed immediately after hatching, continuing until cold weather occurs in October. The larvae are usually found feeding in the upper three inches of soil, with the majority in the first two inches. Very few larvae are found in the zero to two-inch level after the soil temperature begins to decline in the fall of the year. They hibernate at various depths in the soil. The results of two diggings made in the fall of 1942 after several killing frosts had occurred are given in Table 2. A number of very small larvae were found at the six- to seven-inch level in the digging made on October 23. During miscellaneous diggings in the late fall or early spring, occasional larvae have been found as deep as 11 inches. The larvae respond to rising soil temperatures in the spring and may be found feeding in the upper few inches of soil in early April. The spring feeding period continues until the larvae are fully grown, usually about mid-June.

TABLE 2. DEPTH OF LARVAE IN THE FALL OF 1942

October 23, 1942		October 30, 1942	
Depth	No. of larvae	Depth	No. of larvae
1″—3″	3	0 —2″	0
3″—5″	26	2″—3″	11
5″—6″	42	3″—4″	10
6″—7″	26	4″—5″	5
7″—8″	6	5″—6″	0
Total	103	Total	26

Young larvae have been recovered from the field in late July, but no newly hatched grubs have been recovered except from caged material. The caged material was not disturbed until August 4, and newly hatched larvae were recovered when washing and screening the soil for eggs. The larvae were found in the material passing through the 20- and 40-mesh sieves.

While the evidence obtained to date indicates that the larva has three instars, sufficient factual evidence has not been secured to be conclusive on this point.

The larvae apparently feed upon the small roots of plants and organic matter. Large numbers may be found in the soil about the roots of native aster, bush clover and tick clover, which are among the favorite host plants of the adult insect. The larvae have also been found under alfalfa, red clover, goldenrod, and in turf. On June 9, 1942, a total of 214 larvae and six pupae were obtained from an area 15 by 15 inches, in which a clump of native aster was growing. On October 23, 1942, 103 larvae were obtained from an area less than one square foot in extent where native aster was predominant. No evidence of visual injury to plants by the larvae has been observed in any of the various infestations studied.

Pupa

The pupae may be found in the field during the first week in June but are most abundant during the third and fourth week of that month. They are found in the upper inch of soil, usually very close to the surface. As the pupae are very fragile, they are easily injured when the soil is disturbed.

At room temperature, the average length of the pupal period for 11 specimens was seven days, the minimum being five days and the maximum, eight days.

There is a comparatively short prepupal period, varying with the individual insects. In some rearing experiments, small salve tins containing an individual larva and soil were used. Usually inaction for one or two days on the surface of the soil indicated the length of the prepupal period. However, some individuals were active continuously and would not remain on the surface of the soil in the container. Such larvae would burrow into the soil less than 24 hours before pupation.

Adult

The first adults begin to emerge from the soil about June 25. They are most abundant during July and early August. After the first week in August they disappear rapidly, although a few may be found until frosts occur in late September or early October.

The adults are wingless, and as a result, the natural spread of the insect is slow. The weevils are, however, capable of running or crawling a considerable distance.

All of the weevils examined to date were found to be females. The fact that only females occurred was not considered unusual as other otiorhynchids are known to be parthenogenetic. Four *C. setarius* adults were reared from pupae which had been isolated in individual containers. These adults were placed singly in cages containing a potted chrysanthemum. Two of the weevils died in a few days. The soil in the four pots was examined one month after the adults were introduced. No eggs or larvae were found in the two pots originally containing the females which died in a few days. There were three young larvae in the soil of the third pot. The fourth pot contained only the adult weevil which was sluggish in action and died a few days later. This trial indicated that the weevil may function parthenogenetically.

Numerous trials have been made to obtain the total number of eggs deposited by individual females. All have resulted in the females dying before egg deposition was begun or shortly thereafter. In midseason an examination of the ovarioles of 13 adults was made. The reproductive systems were developed in all of the insects and eggs were present in 10 of them. The number of fully developed and partially formed eggs in the individual insects varied from three to 37.

Feeding Habits

The adult feeds in the sunlight or shade, usually on the upper surface or edge of the foliage, Figure 15. When abundant, the adults may be seen readily on the uppermost foliage or blooms of low-growing plants. *C. setarius* is gregarious and may be found in large numbers upon individual leaves and plants. Its feeding habits are characteristic, Figure 16, and similar to those of several other leaf-feeding weevils. At first the edges are notched, and with continuous heavy feeding the foliage or flowers are left in a very ragged state or entirely consumed. As the insect is small, about one-eighth of an inch in length, a large localized population must be present before serious defoliation occurs. The host plants to date include annuals, perennials, shrubs, deciduous trees and evergreens, as follows. The preferred plants are marked with an asterisk.

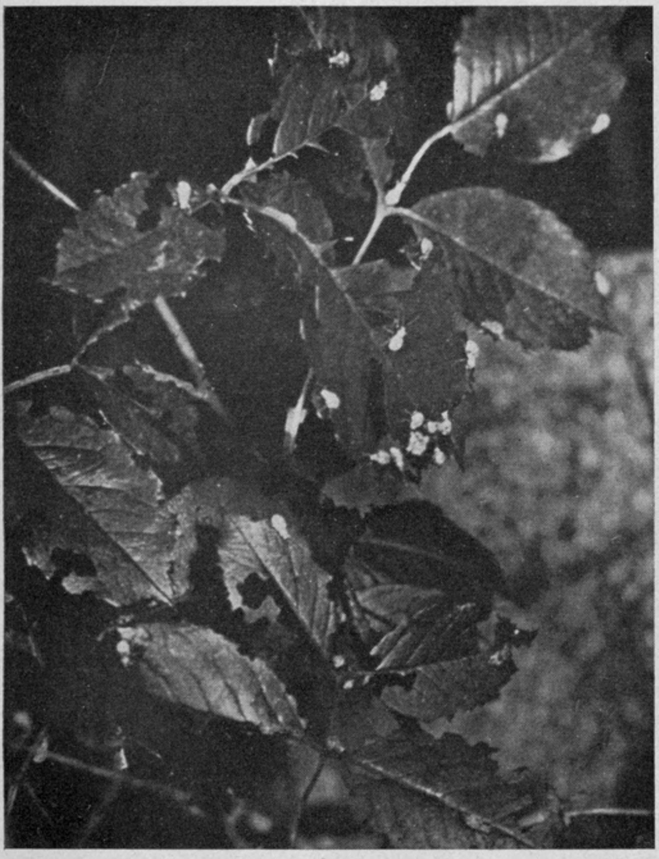


FIGURE 15. Adults feeding on the edges and surface of the foliage of the Dorothy Perkins climbing rose. Slightly reduced.

FIGURE 16. Foliage of a native aster illustrating characteristic feeding of the adult. Reduced.

Host Plants

FIELD, FORAGE AND VEGETABLE CROPS

Alfalfa*	*Medicago sativa*	Potato	*Solanum tuberosum*
Beet	*Beta vulgaris*	Radish	*Raphanus sativus*
Bush lima	*Phaseolus lunatus macrocarpus* (hort. var.)	Red clover*	*Trifolium pratense*
Celery	*Apium graveolens*	Sheep's grass	*Andropogon virginana*
Corn, sweet	*Zea mays*	Snapbean	*Phaseolus vulgaris* (hort. var.)
Cucumber	*Cucumis sativus*	Strawberry	*Fragaria chiloensis*
Kentucky blue grass	*Poa pratensis*	Sweet clover	*Melilotus* sp.
Kohl-rabi	*Brassica oleracea caulo-rapa*	Sweet potato	*Ipomoea batatus*
Parsley	*Petroselinum hortense*	Swiss chard*	*Beta vulgaris* (hort. var.)
Pea, garden	*Pisum sativum*	Tomato	*Lycopersicum esculentum*
Pole lima	*Phaseolus lunatus macrocarpus* (hort. var.)	Turnip	*Brassica rapa*
		White clover	*Trifolium repens*

FLOWERING PLANTS

Ageratum	*Ageratum latifolium*	Hollyhock*	*Althea rosea*
Aster*	*Callistephus chinensis*	Iris	*Iris*
Aster, native*	*Aster puniceus* var. *lucidulus*	Joseph's-coat	*Amaranthus gangeticus melancholius*
Beebalm	*Monarda didyma*	Kalanchoe	*Kalanchoe flammea*
Begonia, wax*	*Begonia* sp.	Lily-of-the-valley	*Convallaria majalis*
Chinese lantern*	*Physalis francheti*	Lupine	*Lupinus perennis*
Chrysanthemum*	*Chrysanthemum* (hort. var.)	Marigold*	*Tagetes erecta*
Columbine*	*Aquilegia* (hort. var.)	Phlox	*Phlox paniculata*
Daylily, lemon*	*Hemerocallis flava*	Rose, hybrid and perpetuals	*Rosa* sp.
Dorothy Perkins rose*	*Rosa* sp.	Scarlet runner	*Phaseolus coccineus*
Dwarf marigold	*Tagetes signata pumila*	Tuberous begonia	*Begonia tuberosa*
Fever few	*Matricaria parthenoides*	Violet (greenhouse)	*Viola* (hort. var.)
Geranium*	*Pelargonium* sp.	Wild rose*	*Rosa* sp.
Gladiolus	*Gladiolus*	Zinnia*	
Gloxinia	*Sinningia speciosa*		

ORNAMENTAL PLANTS, TREES, SHRUBS AND VINES

Abutilon*	*Abutilon* sp.	Mockorange	*Philadelphus* sp.
Allegheny vine	*Adlumia fungosa*	Morning glory (cultivated)	*Ipomoea* sp.
Alligator palm (water plant)		Oak sprouts	*Quercus* sp.
Althea	*Althea anemonaeflorus*	Philodendron	*Philodendron* sp.
Barberry	*Berberis thunbergi*	Poplar	*Populus* sp.
Bigleaf wintercreeper	*Euonymus vegetus*	Porcelain ampelopsis	*Ampelopsis brevipedunculata* var. *maximowiczi*
Boston ivy	*Ampelopsis tricuspidata veitchi*	Pride of Marion ivy	*Hedera* sp.
Bridalwreath	*Spirea prunifolia*	Shrimp plant	*Beloperone guttata*
Coleus*	*Coleus blumei*	Raspberry	*Rubus* sp.
Elderberry	*Sambucus canadensis*	Virginia creeper	*Ampelopsis quinquefolia*
English ivy*	*Hedera helix*	Walnut sprouts	*Juglans* sp.
Deutzia	*Deutzia* sp.	Wild cherry	*Prunus* sp.
Firethorn	*Pyracantha* sp.	Yew	*Taxus cuspidata capitata*
Grape	*Vitis* sp.		
Maple sprouts	*Acer* sp.		
Miniature pepper	*Capsicum* sp.		

WEEDS

Bindweed	*Polygonum* sp.	Morning glory	*Convolvulus tricolor*
Bush clover*	*Lespedeza capitata*	Partridge pea	*Cassia chamaecrista*
Clear weed	*Pilea pumila*	Plantain	*Plantago lanceolata*
————	*Chenopodium urbicum*	Ragweed	*Artemisia ambrosifolia*
Dock	*Rumex* sp.	Smartweed*	*Polygonum* sp.
Hog peanut	*Apios tuberosa*	Sneezeweed	*Helenium* sp.
Knotweed	*Polygonum neglectum*	Sorrel	*Rumex acetosella*
Lamb's-quarters*	*Chenopodium alba*	Tick clover*	*Desmodium canadense*
Meadow sweet	*Filipendula* sp.	Wild mustard	*Brassica* sp.
Milkweed	*Asclepias syriaca*	Yarrow	*Archillea millefolium*

General Habits

C. setarius is very active and its habit of dispersing from areas in which it emerged as an adult is an important factor in its distribution. This dispersion, when from an area of light infestation, may be minor in nature and, when from an area of heavy infestation, may be likened to a migration. One eye-witness in another state describes a dispersal from a field of alfalfa and clover: "The adjoining roadway was covered with thousands of the insects and in the next few days hundreds of them were feeding upon the ornamental plants around the nearby stone dwelling. In addition, many of the insects had found their way into the dwelling and were crawling on the walls, ceilings and furniture."

Numerous other reports have been received of the weevils finding their way into screened buildings and making themselves a nuisance by falling into food containers, crawling on dining tables, getting into beds or eating the foliage of house plants. The only damage observed or reported inside of dwellings has been to house plants, and the nuisance of the insects' presence. Large numbers have been observed dead around a drum of kerosene in a garage, killed by contact with the waste kerosene on the floor. As many as 2,400 of the weevils were collected from a single, deep window well of a hospital located adjacent to an infested field. The insects have been observed crawling on people seated out of doors, on tractors, automobiles, chairs and other movable objects. When disturbed, the insect may become immobile, or fall off the object or plant upon which it was located and remain inactive for a short time. All the various habits of this insect as enumerated are important factors in its potential spread through artificial means.

Control Experiments with Insecticides

All tests with insecticides were limited to the adult stage and were made in laboratory greenhouses having a temperature range of 75 to 85° F. Small cages, 14 inches in height and four inches in diameter, made of 16-mesh wire cloth, were used. A flat, round, wooden plug, with a ⅜-inch hole in the center, was fitted into and fastened to a wire cylinder three inches above the bottom edge to form a tight-fitting floor in each cage. The wire cloth extending below the floor gave stability to the cage when placed over a jar of water. Muslin, held in place with a rubber band, formed the top or roof. Branches or shoots of chrysanthemum foliage, a favorite host plant, were used in the cages. The stem of the branch was wrapped in cotton, inserted from above through the hole in the floor of the cage so as to extend into the water contained in the jar on which the cage was placed. These cages were tight and easily handled. The small weevils could not escape or avoid detection and the chrysanthemum branches would live as long as water was available to them.

The technique followed was to spray or dust the branches and place them in individual cages. Twenty-five field-collected weevils were then placed in each cage. Each test consisted of four units totaling 100 weevils, treated and infested simultaneously.

Preliminary tests were conducted with 3 pounds of lead arsenate plus 3 pounds of white wheat flour to 100 gallons of water, pyrethrum (Red Arrow) 1 part to 200 parts of water, cryolite at 2 and 4 pounds concentration plus 1 pint of soybean oil and 1 ounce of Ultrawet to

100 gallons of water, and cryolite dust (25 per cent) with pyrophyllite as a diluent. The results obtained are given in Table 3.

TABLE 3. PRELIMINARY INSECTICIDE TESTS

Insecticide	Day Treated	Day of Reading	Mortality Treated	Mortality Check
Lead arsenate	7-14-43	7-19-43	43%	0
Pyrethrum	7-22-43	7-26-43	70%	0
Cryolite 2 lbs.	7-14-43	7-19-43	61%	0
Cryolite 4 lbs.	7-29-43	8- 2-43	82%	24%
Cryolite dust 25%	7-22-43	7-26-43	100%	0

As 25 per cent cryolite dust gave the best results in the preliminary tests, further experiments were conducted in the same manner with 25, 12½ and 6¼ per cent cryolite dusts containing pyrophyllite as a diluent. The results are given in Table 4.

TABLE 4. LABORATORY INSECTICIDE TESTS WITH CRYOLITE DUSTS

Insecticide	Day Treated	Day of Reading	Mortality Treated	Mortality Check
Cryolite 25%	7-29-43	8- 2-43	100%	24%
Cryolite 25%	8- 7-43	8-11-43	100%[1]	40%
Cryolite 12½%	8- 7-43	8-10-43	100%	40%
Cryolite 12½%	8-11-43	8-14-43	100%	56%
Cryolite 6¼%	8- 5-43	8-11-43	100%[1]	12%
Cryolite 6¼%	8-11-43	8-14-43	100%	56%

[1] All weevils, except one, were dead on 8-10-43.

Mortality in the treated units was high during the first 24 hours of each test, whereas mortality did not develop as rapidly in the untreated cages. It was evident from the observations made and the results obtained that cryolite dusts were lethal to *C. setarius*. It was also evident that the mortality in the checks was high, and corresponded to the conditions in the field where the insects became less numerous in the fifth and sixth weeks of the adult season.

Summary

The imported long-horned weevil, *Calomycterus setarius* Roelofs, a small insect, native to Japan, has become established in the states of Connecticut, Illinois, Iowa, Maryland, Massachusetts, New York, Pennsylvania and Rhode Island. It is parthenogenetic in habit and has a one-year life cycle. The adults emerge from the soil about June 25, and are most abundant during July and early August. They deposit their eggs in soil or debris. The larvae are present in the soil from July until the following June, pupating in June or early July.

The adults are primarily foliage feeders and may be found feeding upon the leaves and blooms of numerous host plants. They are general feeders and more than 100 host plants have been recorded. These include annuals, perennials, shrubs, deciduous trees and evergreens.

These insects are wingless and their natural spread is slow. However, they crawl upon people, into dwellings, vehicles and many unusual places. This habit, together with the fact that they are parthenogenetic, increases the possibility of artificial spread through the transportation of the adult insect or soil-inhabiting stages.

Though the larvae probably feed upon the small roots of plants and organic matter and may be very numerous in a localized area, no visible damage to plants by this stage has been observed.

Experiments with insecticides for the control of the adult insect have been conducted in the laboratory. Cryolite dust, 25 per cent, gave the best results in the experiments conducted to date.

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